What is claimed is:

1. A method of producing a porous tricalcium phosphate net-shaped material having an intended final shape, comprising:

(a) preparing a reactant mixture comprising calcium oxide and phosphorus pentoxide, wherein the mole percent ratio of said calcium oxide and said phosphorus pentoxide allows the reactant mixture to form tricalcium phosphate upon combustion;

(b) forming said reactant mixture into said intended final shape by placing said mixture into a combustible or noncombustible die having said intended shape and compressing said mixture;

(c) if said die is noncombustible, removing said formed reactant mixture from said die;

(d) heating said formed reactant mixture to at least the ignition temperature of said mixture to produce a net-shaped material by a combustion synthesis reaction, said material comprising alpha tricalcium phosphate or a mixture of alpha and beta tricalcium phosphate; and

(e) optionally subjecting said net-shaped material to conditions sufficient to convert at least a portion of said alpha tricalcium phosphate to beta tricalcium phosphate.

2. The method of claim 1, wherein said reactant mixture comprises between about 60 and 90 mole percent CaO and between about 40 and 10 mole percent P_2O_5.

3. The method of claim 1, wherein the mole percent ratio of calcium oxide:phosphorus pentoxide is from about 66.7:33.3 to about 88.9:1.11.

4. The method of claim 1, wherein the mole percent ratio of calcium oxide:phosphorus pentoxide is about 75:25.

5. The method of claim 1, wherein step (e) comprises:

(i) placing said net shaped material in a furnace;

(ii) heating said furnace to a temperature to a temperature between about 1100 and 1600 °C; and

(iii) cooling said material at a rate that allows conversion of alpha tricalcium phosphate to beta tricalcium phosphate.

6. The method of claim 5, wherein said furnace is heated at a rate of approximately 40 °C per minute.

7. The method of claim 5, wherein said cooling comprises reducing the temperature of said furnace at a rate that allows at least a portion of said alpha tricalcium phosphate to be converted to beta tricalcium phosphate.

8. The method of claim 7, wherein said temperature is reduced to approximately room temperature over a period of 2 to 3 hours.

9. The method of claim 5, wherein said cooling comprises removing said material from said furnace and allowing said material to cool in ambient air.

10. The method of claim 1, wherein said reactant mixture further comprises one or more dopants.

11. The method of claim 10, wherein said dopant is selected from the group consisting of SiO_2, TiO_2, Al_2O_3, MgO, K_2O, NaO, and Zn or mixtures thereof.

12. The method of claim 1, wherein said reactant mixture further comprises a gasifying agent.

13. The method of claim 12, wherein said gasifying agent is P_2O_5 or B_2O_3.

14. The method of claim 1, wherein said method produces a net-shaped tricalcium phosphate material has non-uniform porosity.

15. The method of claim 14, wherein said porosity is functionally graded.

16. The method of claim 1, wherein step (d) is accomplished by applying a current from a tungsten filament to a specific site on said shaped mixture.

17. The method of claim 16, wherein said current is from about 1-1000 amps and is applied for about 1-10 seconds.

18. The method of claim 1, wherein step (e) comprises subjecting at least a portion of said net shaped material to microwave heating.

19. The method of claim 1, wherein step (d) is accomplished by placing said shaped mixture in a furnace and heating said furnace to a temperature above the ignition temperature.

20. The method of claim 1, wherein step (e) comprises applying a laser beam to at least a portion of said net shaped material.

21. A method of producing a porous tricalcium phosphate net-shaped material having two or more layers of different porosities, comprising:

(a) preparing a first reactant mixture comprising calcium oxide and phosphorus pentoxide, wherein the mole percent ratio of said calcium oxide and said phosphorus

pentoxide allows said first reactant mixture to form tricalcium phosphate upon combustion;

(b) placing said first reactant mixture into a combustible or noncombustible die having an intended shape for said net-shaped material and compressing said first reactant mixture;

(c) if said die is noncombustible, removing said formed reactant mixture from said die;

(d) heating said first reactant mixture to at least the ignition temperature of said first mixture to produce a first layer of material by a combustion synthesis reaction, said first layer having a first porosity and comprising alpha tricalcium phosphate or a mixture of alpha and beta tricalcium phosphate;

(e) preparing a second reactant mixture comprising calcium oxide and phosphorus pentoxide, wherein the mole percent ratio of said calcium oxide and said phosphorus pentoxide allows said second reactant mixture to form tricalcium phosphate upon combustion;

(f) placing said second reactant mixture into a combustible or noncombustible die having said intended shape and compressing said second reactant mixture;

(g) if said die is noncombustible, removing said formed second reactant mixture from said die;

(h) placing said formed second reactant mixture on said first layer;

(i) heating said second reactant mixture to at least the ignition temperature of said second mixture to produce a second layer by a combustion synthesis reaction having a second porosity, said second layer being fused to said first layer and comprising alpha tricalcium phosphate or a mixture of alpha and beta tricalcium phosphate, wherein the composition of said second reactant mixture and/or said compressing step result in said second material layer a second pore size; and

(j) optionally subjecting said net-shaped material to conditions sufficient to convert at least a portion of said alpha tricalcium phosphate in one or both of said layers to beta tricalcium phosphate.

22. A method of producing a porous tricalcium phosphate net-shaped material having two or more layers of different porosities, comprising:

(a) preparing a first reactant mixture comprising calcium oxide and phosphorus pentoxide, wherein the mole percent ratio of said calcium oxide and said phosphorus

pentoxide allows said first reactant mixture to form a tricalcium phosphate material having a first porosity upon combustion;

(b) placing said first reactant mixture into a combustible or noncombustible die having an intended shape for said net-shaped material and compressing said first reactant mixture;

(c) preparing a second reactant mixture comprising calcium oxide and phosphorus pentoxide, wherein the mole percent ratio of said calcium oxide and said phosphorus pentoxide allows said second reactant mixture to form a tricalcium phosphate material having a second porosity upon combustion;

(d) placing said second reactant mixture into said die on top of said first reactant mixture and compressing said second reactant mixture;

(e) if said die is noncombustible, removing said formed second reactant mixture from said die;

(f) rapidly heating said compressed reactant mixtures in a furnace at a temperature sufficient to produce a net-shaped material by a combustion synthesis reaction, said material comprising alpha tricalcium phosphate or a mixture of alpha and beta tricalcium phosphate; and

(g) optionally subjecting said net-shaped material to conditions sufficient to convert at least a portion of said alpha tricalcium phosphate to beta tricalcium phosphate.

23. A method for preparing a TCP net-shaped material, comprising:

(a) preparing a reactant mixture comprising calcium oxide and phosphorus pentoxide, wherein the mole percent ratio of said calcium oxide and said phosphorus pentoxide allows the reactant mixture to form tricalcium phosphate upon combustion;

(b) forming said reactant mixture into said intended final shape by placing said mixture into a combustible die having said intended shape and compressing said mixture;

(c) rapidly heating said compressed reactant mixture in a furnace at a temperature sufficient to produce a net-shaped material by a combustion synthesis reaction, said material comprising alpha tricalcium phosphate or a mixture of alpha and beta tricalcium phosphate; and

(e) reducing the temperature of the furnace at a controlled rate to convert at least a portion of the alpha TCP to beta TCP.

24. A porous tricalcium phosphate net-shaped material produced by the method of claim 1.

25. The net-shaped material of claim 24, having a pore volume of at least 50-80%.

26. The net-shaped material of claim 24, further comprising at least one dopant.

27. The net-shaped material of claim 26, wherein said dopant is selected from the group consisting of SiO_2, TiO_2, Al_2O_3, MgO, K_2O and NaO.

28. The net-shaped material of claim 24 having a non-uniform porosity.

29. The net-shaped material of claim 28, wherein said porosity is functionally graded.

30. The net-shaped material of claim 24, having a functional gradient of said alpha and beta tricalcium phosphates.

31. The net-shaped material of claim 24, in the form of an orthopedic implant.

32. A porous tricalcium phosphate net-shaped material produced by the method of claim 22.

33. A porous tricalcium phosphate net-shaped material produced by the method of claim 23.